

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings of claims in the application:

Listing of Claims:

- 1 1. (Currently amended): A data relay apparatus comprising:
2 a multiplexing circuit configured to operate in accordance with Link Aggregation
3 multiplexing;
4 a first group of one or more data ports, each connected to a communication line;
5 a second group of one or more data ports, each connected to a communication
6 line; and
7 a controller configured to receive data from data ports of said first group and to
8 transmit all of said data via data ports of said second group;
9 said controller configured to receive data from data ports of said second group
10 and to transmit all of said data via data ports of said first group;
11 said controller having a port management table including a physical port number
12 indicating the number for each data port of said first group and said second group, a physical port
13 status indicating a status of each data port, a logical port number expressing a logical port
14 comprising two or more physical ports, a logical port status indicating a status of each logical
15 port, and a ling group number identifying communication lines associated with each logical port,
16 said controller configured to disable all data ports of said second group in
17 response to detecting that data communication is not available via any data port of said first
18 group, said controller disabling said data ports of said second group by electronically cutting off
19 and shutting down communication lines connected to said data ports of said second group, said
20 controller configured to update said port management table according to said disabling,
21 said controller configured to disable all data ports in said first group in response to
22 detecting that data communication is not available via any data port in said second group, said
23 controller disabling said data ports of said first group by electronically cutting off and shutting

24 down communication lines connected to said data ports of said first group, said controller
25 configured to update said port management table according to said disabling.

1 2. (Original): The data relay apparatus of claim 1 wherein said controller is
2 further configured to enable all data ports of said first and second groups when all of said data
3 ports have been disabled for a first period of time, to determine if communication is available via
4 any data port of said first group or via any data port of said second group, and to disable all of
5 said data ports if it is determined that said communication is not available.

1 3. (Original): The data relay apparatus of claim 1 wherein said controller is
2 further configured to send test data through data ports of said first group and of said second
3 group to detect whether data communication is available via said data ports.

1 4. (Original): The data relay apparatus of claim 3 wherein said test data
2 include ICMP (internet control management protocol) ECHO requests, or ARP (address
3 resolution protocol) messages, or LACP (link aggregation control protocol) control messages.

1 5. (Original): The data relay apparatus of claim 1 wherein said controller is
2 further configured to monitor data ports of said first group and of said second group for hardware
3 error conditions in said data ports to detect whether data communication is available via said data
4 ports.

1 6. (Original): The data relay apparatus of claim 1 as incorporated in a data
2 relay system, said data relay system comprising at least a first one of said data relay apparatus, a
3 second one of said data relay apparatus, and a third one of said data relay apparatus,

4 data ports of said first group in said first data relay apparatus being configured for
5 data communication with a data terminal,

6 data ports of said first group in said second data relay apparatus being configured
7 for data communication with said data terminal,

8 data ports of said second group in said first data relay apparatus being in data
9 communication with data ports of said first group in said third data relay apparatus,

10 data ports of said second group in said second data relay apparatus being in data
11 communication with data ports of said first group in said third data relay apparatus,
12 wherein data transmission between said data terminal and said third data relay
13 apparatus occurs via said first data relay apparatus or via said second data relay apparatus.

1 7. (Original): The data relay apparatus of claim 1 further including at least a
2 third group of one or more data ports and a fourth group of one or more data ports,
3 said controller further configured to transmit all first data received from data ports
4 of said first and third groups to data ports of said second group or to data ports of said fourth
5 group based on information contained in said first data,

6 said controller further configured to transmit all second data received from data
7 ports of said second and fourth groups to data ports of said first group or to data ports of said
8 third group based on information contained in said second data,

9 said controller further configured to disable all data ports of said first, second,
10 third, and fourth groups in response to detecting that data communication is not available via any
11 data port of said first group and via any data port of said third group,

12 said controller further configured to disable all data ports of said first, second,
13 third, and fourth groups in response to detecting that data communication is not available via any
14 data port of said second group and via any data port of said fourth group.

1 8. (Original): The data relay apparatus of claim 7 as incorporated in a data
2 relay system comprising at least a first one of said data relay apparatus, a second one of said data
3 relay apparatus, a third one of said data relay apparatus, and a fourth one of said data relay
4 apparatus,

5 data ports of said second group in said first data relay apparatus being in data
6 communication with data ports of said first group in said third data relay apparatus,

7 data ports of said fourth group in said first data relay apparatus being in data
8 communication with data ports of said first group in said fourth data relay apparatus,

9 data ports of said second group in said second data relay apparatus being in data
10 communication with data ports of said third group in said third data relay apparatus,

11 data ports of said fourth group in said second data relay apparatus being in data
12 communication with data ports of said third group in said fourth data relay apparatus.

1 9. (Currently amended): A data relay apparatus operating according to Link
2 Aggregation multiplexing comprising:

3 a first plurality of data ports, each connected to a communication line;
4 a second plurality of data ports, each connected to a communication line; and
5 a controller configured to receive first data from said first data ports and to
6 transmit all of said first data via one or more of said second ports, said controller further
7 configured to receive second data from said second ports and to transmit all of said second data
8 via one or more of said first ports;

9 said controller having a port management table including a physical port number
10 indicating the number for each data port of said first group and said second group, a physical port
11 status indicating a status of each data port, a logical port number expressing a logical port
12 comprising two or more physical ports, a logical port status indicating a status of each logical
13 port, and a link group number identifying communication lines associated with each logical port,

14 said controller further configured to determine if communication is not possible
15 via any of said first data ports by transmitting test data via said first data ports and if
16 communication is not possible via any of said first data ports, then to disable all of said first and
17 second data ports by removing power from circuitry comprising said data ports and to update
18 said port management table according to said disabling,

19 said controller further configured to determine if communication is not possible
20 via any of said second data ports by transmitting test data via said second data ports and if
21 communication is not possible via any of said second data ports, then to disable all of said first
22 and second data ports by removing power from circuitry comprising said data ports and to update
23 said port management table according to said disabling.

1 10. (Original): The data relay apparatus of claim 9 wherein said controller is
2 further configured:

3 to re-enable all of said first and second data ports after a first period of time;

4 to re-determine if communication is possible via any of said first data ports and
5 via any of said second data ports; and

6 if not to disable all of said first and second data ports.

1 11. (Original): The data relay apparatus of claim 9 wherein said test data
2 include ICMP (internet control management protocol) ECHO requests, or ARP (address
3 resolution protocol) messages, or LACP (link aggregation control protocol) control messages.

1 12. (Currently amended): In a data relay apparatus having a plurality of data
2 ports operating according to Link Aggregation multiplexing, a method for relaying data
3 comprising:

4 receiving first data from communication lines connected to a first group
5 comprising one or more of said data ports;

6 receiving second data from communication lines connected to a second group
7 comprising one or more of said data ports;

8 transmitting all of said first data via data ports of said second group;

9 transmitting all of said second data via data ports of said first group; and

10 maintaining a port management table including a physical port number indicating
11 the number for each data port of said first group and said second group, a physical port status
12 indicating a status of each data port, a logical port number expressing a logical port comprising
13 two or more physical ports, a logical port status indicating a status of each logical port, and a logical
14 group number identifying communication lines associated with each logical port; and

15 determining whether transmission of data is not successful via any of said data
16 ports of said first group or via any of said data ports of said second group and if so, then
17 disabling all data ports of said first and second groups including removing power from circuitry
18 comprising said data ports and updating said port management table.

1 13. (Original): The method of claim 12 further including, subsequent to said
2 disabling, enabling all data ports of said first and second groups, determining whether
3 transmission of data is not successful via any of said data ports of said first group or via any of
4 said data ports of said second group, and, if so, disabling all data ports of said first and second
5 groups.

1 14. (Original): The method of claim 12 wherein said determining includes
2 transmitting first test data through data ports of said first group and transmitting second test data
3 through data ports of said second group.

1 15. (Original): The method of claim 14 wherein said first and second test data
2 include ICMP (internet control management protocol) ECHO requests, or ARP (address
3 resolution protocol) messages, or LACP (link aggregation control protocol) control messages.

1 16. (Original): The method of claim 12 wherein said determining includes
2 detecting error conditions in circuitry comprising data ports of said first group and said second
3 group.

1 17. (Original): The method of claim 12 wherein a first one of said data relay
2 apparatus, a second one of said data relay apparatus, and a third one of said data relay apparatus
3 is incorporated in a data switching system, said method further including:

4 transferring third data between a data source and data ports of said first group in
5 said first and second data relay apparatuses;

6 transferring said third data between data ports of said second group in said first
7 and second data relay apparatuses and data ports in said third data relay apparatus,

8 wherein data transfer between said data source and said third data relay apparatus
9 can occur via said first data relay apparatus or via said second data relay apparatus.

1 18. (Original): The method of claim 12 further including:
2 receiving third data from a third group comprising one or more of said data ports;
3 receiving fourth data from a fourth group comprising one or more of said data
4 ports;
5 transmitting all of said first data via data ports of said second group or via data
6 ports of said fourth group, depending on information contained in said first data;
7 transmitting all of said second data via data ports of said first group or via data
8 ports of said third group, depending on information contained in said second data;
9 transmitting all of said third data via data ports of said second group or via data
10 ports of said fourth group, depending on information contained in said third data;
11 transmitting all of said fourth data via data ports of said first group or via data
12 ports of said third group, depending on information contained in said fourth data;
13 determining whether transmission of data is not successful via any of said data
14 ports of said first and third groups and if so disabling data ports of said first, second, third, and
15 fourth groups; and
16 determining whether transmission of data is not successful via any of said data
17 ports of said second and fourth groups and if so disabling data ports of said first, second, third,
18 and fourth groups.

1 19. (Original): The method of claim 18 wherein a first one of said data relay
2 apparatus, a second one of said data relay apparatus, a third one of said data relay apparatus, and
3 a fourth one of said data relay apparatus are incorporated in a data switching system, said method
4 further comprising:
5 transferring fifth data between a first data source and data ports of said first group
6 in said first data relay apparatus;
7 transferring said fifth data between data ports of said second and fourth groups in
8 said first data relay apparatus and data ports in said third and fourth data relay apparatuses;
9 transferring sixth data between said first data source and data ports of said first
10 group in said second data relay apparatus;

11 transferring said sixth data between data ports of said second and fourth groups in
12 said second data relay apparatus and data ports in said third and fourth data relay apparatuses;
13 wherein data transfers between said first data source and said third and fourth data
14 relay apparatuses can occur via said first data relay apparatus or via said second data relay
15 apparatus.

1 20. (Original): The method of claim 19 further comprising:
2 transferring seventh data between a second data source and data ports of said third
3 group in said first data relay apparatus;
4 transferring said seventh data between data ports of said second and fourth groups
5 in said first data relay apparatus and data ports in said third and fourth data relay apparatuses;
6 transferring eighth data between said second data source and data ports of said
7 third group in said second data relay apparatus;
8 transferring said sixth data between data ports of said second and fourth groups in
9 said second data relay apparatus and data ports in said third and fourth data relay apparatuses;
10 wherein data transfers between said second data source and said third and fourth
11 data relay apparatuses can occur via said first data relay apparatus or via said second data relay
12 apparatus.

1 21. (Currently amended): A data relay apparatus comprising:
2 a first group of ~~one or more~~ a plurality of data ports;
3 a second group of ~~one or more~~ a plurality of data ports;
4 means for relaying all data received by data ports in one of said first and second
5 groups to data ports in the other of said first and second groups according to Link Aggregate
6 multiplexing;
7 means for maintaining a port management table including a physical port number
8 indicating the number for each data port of said first group and said second group, a physical port
9 status indicating a status of each data port, a logical port number expressing a logical port
10 comprising two or more physical ports, a logical port status indicating a status of each logical
11 port, and a ling group number identifying communication lines associated with each logical port;

12 means for detecting when all data ports of said first group or all data ports of said
13 second group are incapable of successful data transmission; and
14 means, in response to said means for detecting, for disabling all data ports of said
15 first and second groups including removing power from circuitry comprising said data ports and
16 updating said port management table.

1 22. (Original): The apparatus of claim 21 further including means for
2 restoring said data ports after said data ports have been disabled for a first period of time for
3 detecting again if all data ports of said first group or all data ports of said second group are
4 incapable of successful data transmission and in response thereto disabling all data ports of said
5 first and second groups.

1 23. (Original): The apparatus of claim 21 wherein said means for detecting
2 includes means for transmitting test data through said data ports.

1 24. (Original): The apparatus of claim 23 wherein said test data includes
2 ICMP (internet control management protocol) ECHO requests, or ARP (address resolution
3 protocol) messages, or LACP (link aggregation control protocol) control messages.

1 25. (Original): The apparatus of claim 21 wherein said means for detecting
2 includes means for detecting error conditions in the circuitry comprising said data ports.

1 26. (Currently amended): A data relay system comprising:
2 a first data relay apparatus;
3 a second data relay apparatus;
4 a third data relay apparatus; and
5 at least a fourth data relay apparatus,
6 each of said relay apparatuses comprising:
7 a plurality of first data ports;
8 a plurality of second data ports; and

9 a controller configured to receive data from one of said first data ports and
10 to transmit said data via one of said second data ports according to Link Aggregate multiplexing,
11 based on information contained in said data; and

12 a port management table including a physical port number indicating the
13 number for each data port of said first group and said second group, a physical port status
14 indicating a status of each data port, a logical port number expressing a logical port comprising
15 two or more physical ports, a logical port status indicating a status of each logical port, and a ling
16 group number identifying communication lines associated with each logical port,

17 said controller configured to disable all of said second data ports in
18 response to detecting that data communication is not available via any of said first data ports,

19 said controller configured to disable all of said first data ports in response
20 to detecting that data communication is not available via any of said second data ports,

21 said second data ports of said first data relay apparatus, each configured for data
22 communication with one of said first data ports of either said third data relay apparatus or said
23 fourth data relay apparatus,

24 said second data ports of said second data relay apparatus, each configured for
25 data communication with one of said first data ports of either said third data relay apparatus or
26 said fourth data relay apparatus.

1 27. (Original): The system of claim 26 further including a first data terminal
2 and a second data terminal, each of said data terminals configured to send data to said first data
3 ports of said first and second data relay apparatuses, wherein each of said data terminals can
4 communicate with said third and fourth data relay apparatuses via said first data relay apparatus
5 or via said second data relay apparatus.